Technical Background

Monitor and Control System Software

The Automated Tracking Station

System Capabilities

- autonomous (hands-off) orchestration of ground station components to achieve spacecraft communication for nominal supports
- error detection and reporting for anomalous conditions
- autonomous (hands-off) reporting of ground station pass results
- autonomous (hands-off) reporting of real time ground station status
- ground station setup specification
- system level diagnostics and testing via device and system control

The Automated Tracking Station

Definitions

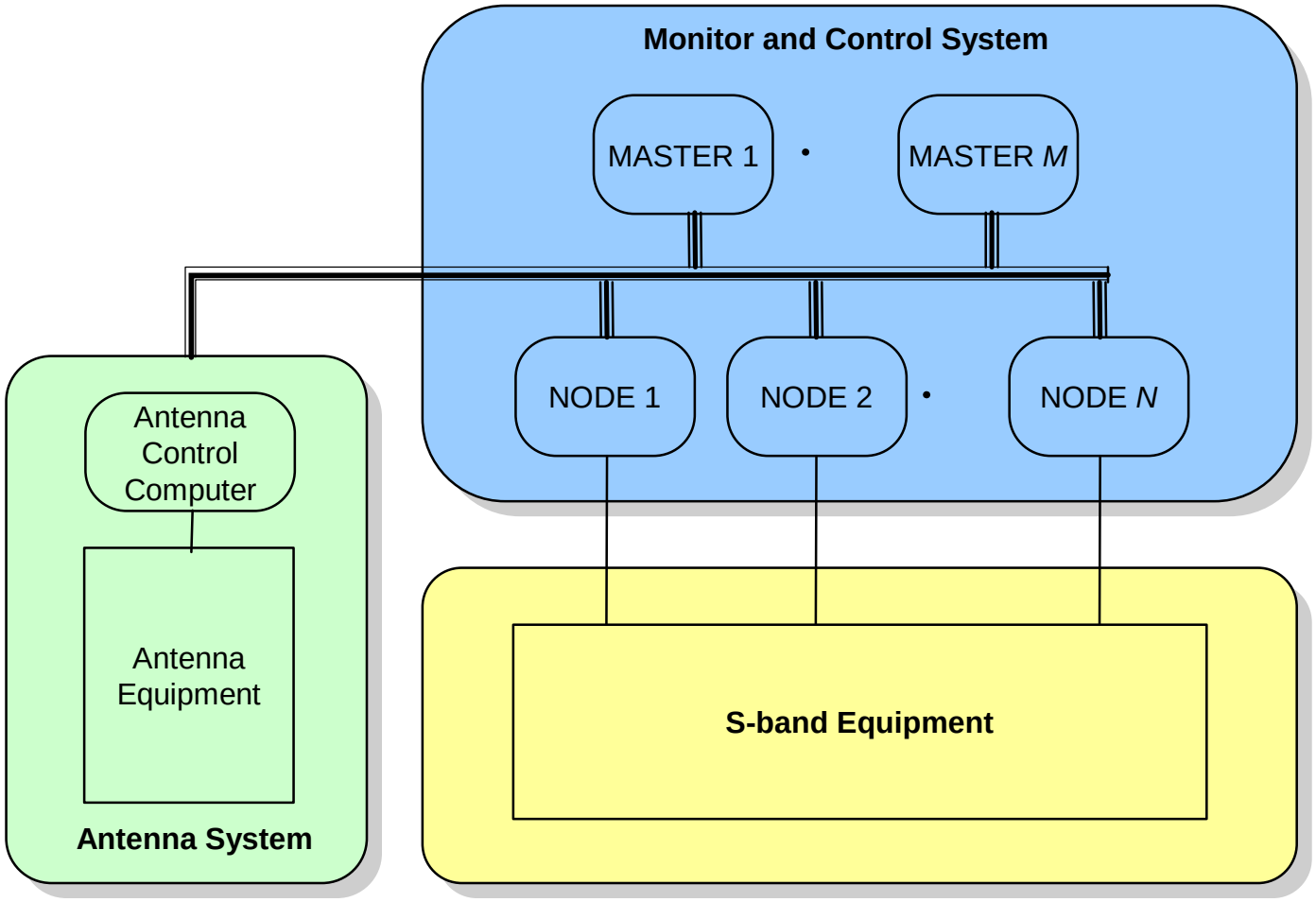
The *Master* is the seat at which centralized control and monitoring of the station is exercised.

The *Remote Nodes* exercise low level control of a subset of equipment, taking direction from and reporting to the Master.

An *Integrated Independent System* is an existing or COTS system integrated into the automated system.

The Automated Tracking Station

System Interface (simplified)



The Automated Tracking Station

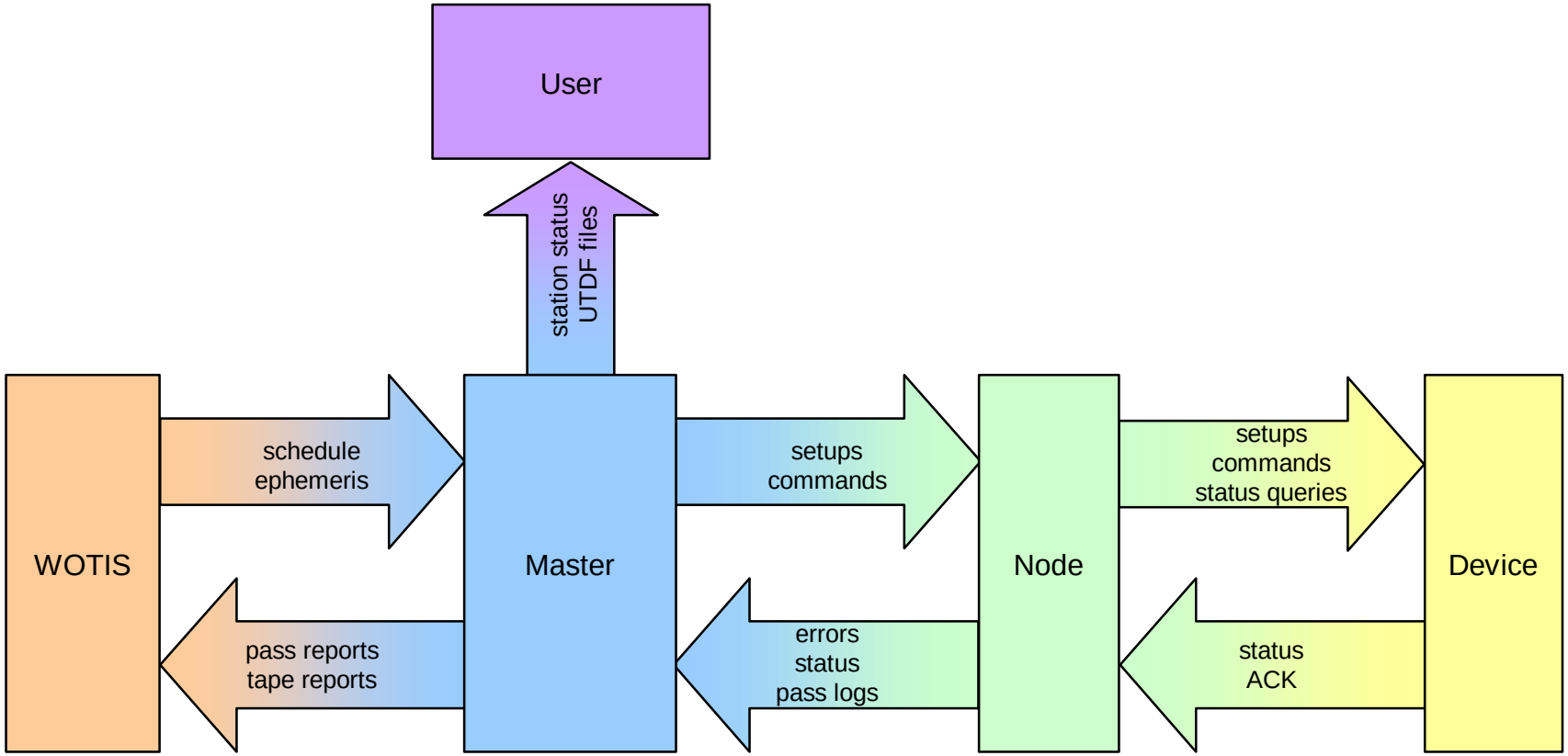
Master Functions

- Create and modify support profiles.
- Ingest and interpret schedule.
- Distribute configuration information to Nodes.
- Manage setup, start, stop, takedown of support.
- Monitor support progress.
- Provide interface to all automated assets.
- Generate post-support reports.
- Monitor and report station status.

Remote Node Functions

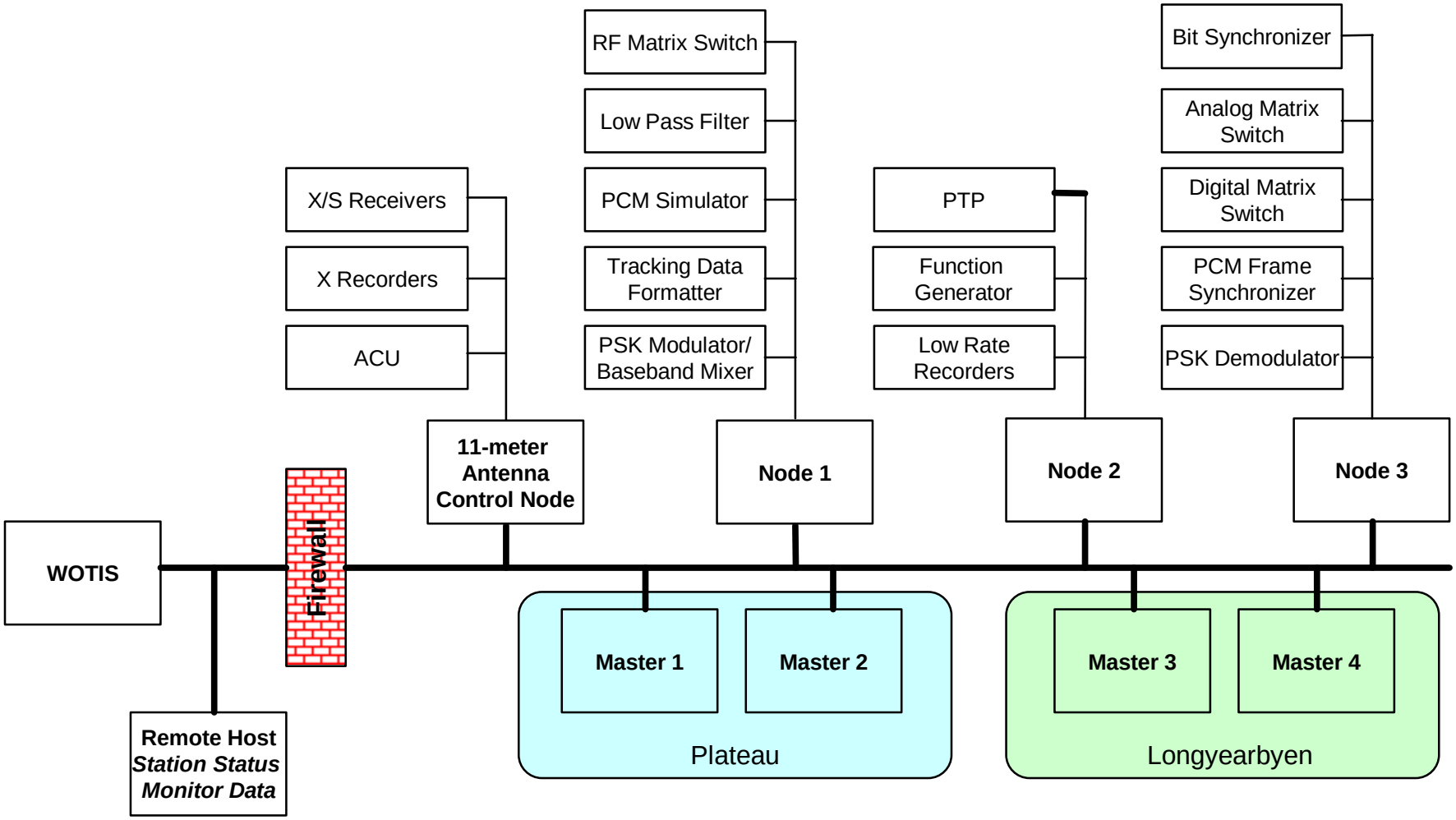
- Report on equipment availability.
- Receive equipment configuration information from Masters.
- Handle commands to Request, Setup, Start, Stop, and Takedown equipment.
- Report equipment status.
- Log equipment support information.
- Send equipment logs to Masters.
- Provide local monitor and control of equipment in the event of a Master-Node network failure.

Subsystem Interfaces



The Automated Tracking Station

SGS Architecture



The Automated Tracking Station

Real Time Status Display

Definition:

The Real Time Status Display is a tool with which a customer can monitor the status of the automated tracking station during a support for a specific satellite.

Protocol:

TCP/IP socket connection initiated by Master (one way) initiated at setup, closed at takedown

Rate:

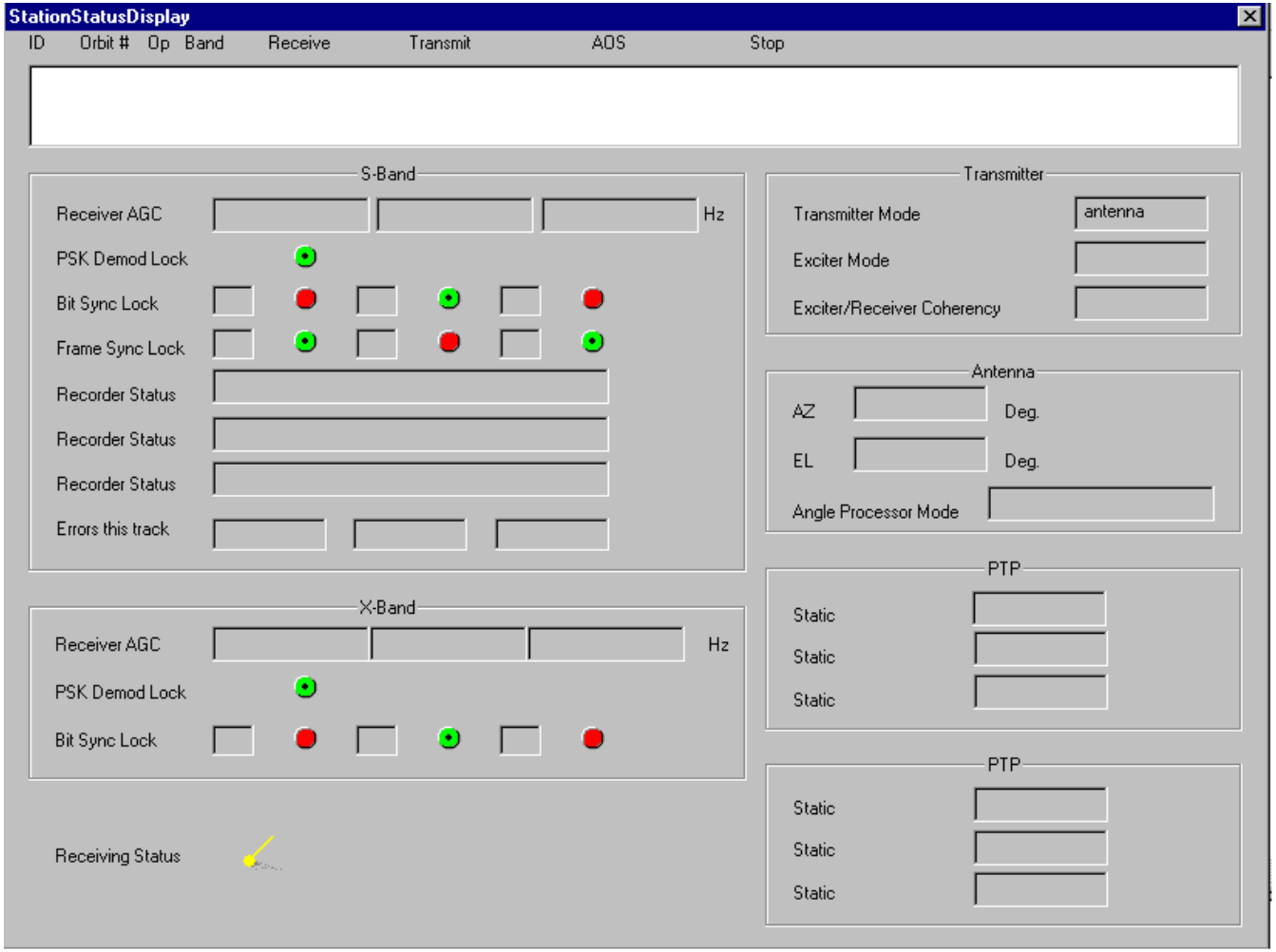
1 message each 10 seconds

Real Time Status Display Contents

- Az / El of antenna
- Angle processor mode (program/autotrack)
- Receive AGC (for S and X-band)
- PSK Demod lock and/or Bit sync (for S and X-band)
- PTP status
- Exciter mode (modulation being applied or not?)
- Exciter/Receiver Coherency
- S-band recorder mode
- S-band frame synchronizer lock
- S-band frame synchronizer cumulative errors
- Schedule

The Automated Tracking Station

Real Time Status Display GUI



A Day In The Life of an Automated Station

Time	Event	Master Activity	Node Activity
-12 hours	Schedule (including ephemeris) sent from WOTIS	Ingest schedule Parse schedule Select profiles for supports Add support to station schedule Wait	None None None None Wait
-15 min	Initialize	Send schedule, ephemeris, configuration to 11m Antenna Node Send device requests to nodes	11M: ingest schedule, ephemeris, and configuration Nodes: assign devices
-12 min	Pre-pass	None	11M: begin pre-pass activities, open logs
-10 min	Equipment setup	Send device configurations to nodes	Configure devices, begin reporting status
-3	TEST	Orchestrate scripted test sets	Perform scripted activities, report status
-1	Ready	Orchestrate reset for pass	All devices to 'ready' state, report status
0	AOS	Monitor and report status	Report status, accumulate logs
+10 min	LOS	Send 'stop' to nodes	Halt device operations, report status
+14 min	Takedown	Gather logs	Report log files, reset devices
+15 min	Report	Send WOTIS/other reports	None
+16 min	Idle	Wait	Wait
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XXXX	Schedule sent	See above	None
XXXX	Setup Specification	User creates/modifies profile	None
XXXX	Diagnostic	User operates device GUI	Implement discrete commands/report

COTS Products

- Microsoft Foundation Class Library
  - GUI objects/classes
  - → *consistent look and feel for all GUIs*
- Microsoft Developer Studio Class Wizard
  - Code generation tool for GUI applications
  - → *standardized template for all GUIs*
- Rogue Wave Foundation Class Library
  - Data structures and data management classes
  - → *standardized data handling*
- Hummingbird Exceed
  - X terminal emulator
  - → *Interface to integrated independent systems*